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Northeast Energy Associates, L.P.

92 Depot Street
Bellingham, MA

Nominal 304 MW Combustion Turbine
Combined Cycle Generating Facility

RE: Bellingham

Transmittal No.: X239473
Application No.: CE-11-032
Class: OP

FMF No.: **204934**

**PREVENTION OF SIGNIFICANT
DETERIORATION PERMIT**

Pursuant to the provisions of the Clean Air Act (“CAA”) Chapter I, Part C (42 U.S.C. Section 7470, *et. seq*) and the regulations found at the Code of Federal Regulations Title 40, Section 52.21, the Massachusetts Department of Environmental Protection (“MassDEP”) is modifying a Prevention of Significant Deterioration (“PSD”) Permit for Northeast Energy Associates, L.P.’s generating facility located at 92 Depot Street, Bellingham, MA (“Facility”). The PSD Permit is for a nominal 304 MW combustion turbine combined cycle generating facility.

The operation of the combined cycle facility shall be subject to the attached permit conditions and permit limitations. This permit shall be effective 30 days from receipt of notice from MassDEP of permit issuance and shall remain in effect until rescinded by or surrendered to MassDEP. This permit does not relieve Northeast Energy Associates, L.P. (“Permittee”) from the obligation to comply with applicable state and federal air pollution control rules and regulations. All terms and conditions of the permit are enforceable by MassDEP, the United States Environmental Protection Agency (“EPA”), and citizens under the CAA.

This final document copy is being provided to you electronically by the
Department of Environmental Protection. A signed copy of this document
is on file at the DEP office listed on the letterhead.

Roseanna E. Stanley
Permit Chief

August 10, 2015
Date Issued

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Project Description

On December 28, 2011 the Permittee submitted an application under Transmittal Number X239473 to revise the gas-fired startup/shutdown Carbon Monoxide (“CO”) and Volatile Organic Compounds (“VOC”) emission limits. The Permittee requested that the following modifications be made to the existing PSD Permit (PSD permit number CR-88-PSD-R-001) to properly characterize existing startup gas-fired CO pounds per million British Thermal Units (“lb/MMBtu”) emissions:

1. Change startup/shutdown natural gas-fired CO lb/ MMBtu limit from 0.113 lb/ MMBtu to 0.183 lb/ MMBtu with an alternative limit of 1.2 lb/ MMBtu applicable to instances when a combustion turbine does not operate for at least 120 consecutive minutes.
2. Change startup/shutdown natural gas-fired VOC lb/ MMBtu limit from 0.0086 lb/ MMBtu to 0.0153 lb/ MMBtu since it is calculated from the CO limit.

These changes are reflected in Table 2A.

The Permittee did not propose to make any changes to the existing physical equipment at the Facility, or make any changes in actual emissions from the Facility, in this project proposal.

Additional minor permit revisions have been made to this PSD Permit number X239473 to reflect updates since the previous PSD Permit revision (PSD permit number CR-88-PSD-R-001)

From the effective date of this PSD Permit number X239473, this Permit will supersede in its entirety PSD permit number CR-88-PSD-R-001 issued by EPA on 12/23/2008.

A. General Requirements

1. All requirements of this permit which apply to Northeast Energy Associates, L.P. shall also apply to all subsequent owners and/or operators of the facility.
2. The Permittee shall comply with all applicable state and federal air pollution control regulations including the requirements of the New Source Performance Standards (40 CFR Part 60) and the Standards of Performance of stationary gas turbines (40 CFR Part 60, Subpart GG).
3. Each Emission Unit (“EU”) identified in Table 1 is subject to and regulated by this PSD Permit:

Table 1			
EU	Description	Design Capacity	Pollution Control Device (PCD)
1	Westinghouse Turbine Model No. 501D5	111 MW	Steam Injection
2	Westinghouse Turbine Model No. 501D5	111 MW	Steam Injection

Table 1 Key:

EU = Emission Unit

MW = Megawatt

PCD = Pollution Control Device

B. Operating Conditions and Restrictions

1. Exclusive of startup and shutdown, the NO_x control system will be fully operational.
2. After January 22, 2009, any new shipments of fuel oil at the permitted facility shall meet a sulfur content of 15 parts per million by weight (“ppmw”) or less. The Permittee will be allowed to combust the remaining distillate oil in its tank provided that the Permittee does not exceed the Sulfur Dioxide (“SO₂”) tons per rolling period emission limit shown in Table 2B.

C. Emission Limits

1. The Permittee is subject to, and shall not exceed the Operational, Production, and Emission Limits as contained in Tables 2, 2A, and 2B:

Table 2				
EU	Operational / Production Limit	Air Contaminant	Emission Limits (Notes 1 & 2)	
			lb/MMBtu (Per Turbine)	lb/Hour (Plant Total : EU 1 and 2)
1 and 2	Natural Gas	PM/PM ₁₀	0.0047	12.0
		SO ₂	0.0016	4.0
		NO _x	0.0859	220.0
		CO	0.0516	132.0
		VOC	0.0043	11.0
	1. Not to exceed 2880 hours per year operation on fuel oil (Note 3) 2. Sulfur content of fuel oil received not to exceed 15 ppmw (Note 4)	PM/PM ₁₀	0.0647	160.0
		SO ₂ ⁴	0.0016	4.6
		NO _x	0.1497	370.0
		CO	0.3277	810.0
		VOC	0.0151	37.4
	4. Opacity ⁵ – exclusive of uncombined water shall not exceed 10% based on a six minute averaging period, during all modes of operation except oil-fired startups and shutdowns, when opacity shall not exceed 20% for a period or aggregate period of time in excess of six minutes during any one hour provided that, at no time during the said six minutes shall the opacity exceed 40%.			

Table 2 Notes:

1. Averaging Time – Exclusive of startup and shutdown data, compliance with the NO_x and CO lbs/MMBtu and lbs/hour limits in Table 2 shall be determined using one hour block averages from the CEMS calculated using the valid hour criteria established in EPA 40 CFR 75.10(d)(1), for NO_x and 40 CFR 60.13(h)(2) for CO. Compliance with the opacity limit in Table 2 shall be determined using six minute block averages from the COMS calculated using the criteria defined by 40 CFR 60.13(h)(1).
2. The NO_x, CO and VOC lb/MMBtu and pounds per hour (“lb/hr”) emission limits in Table 2 do not apply during hours of startup and shutdown of EU 1 and/or EU 2.
3. EU 1 and EU 2 may operate for any combination of hours on distillate fuel oil such that the Facility does not exceed a total of 2880 hours during any 12-month rolling period.
4. Equivalent to a sulfur-in-fuel limit of 15 ppmw. SO₂ limits of 0.2136 lb/MMBtu and 528 lb/hr, corresponding to the previously approved limit of 0.2 weight percent sulfur fuel oil applied until such time as the previously received higher-sulfur fuel oil in tank(s) was diluted by receipts of 15 ppmw sulfur fuel oil to the point where the average sulfur content of the fuel oil did not exceed 15 ppmw for 5 consecutive samples.

5. Opacity means that characteristic of matter which renders it capable of interfering with the transmission of rays of light and causes an obscuration of an observer's view.

Table 2 Key:

EU = Emission Unit

CO = Carbon Monoxide

PM = Particulate Matter (filterable only)

lb/MMBtu = pounds per million British thermal unit

% = percent

ppmw = parts per million by weight

VOC = Volatile Organic Compounds

NO_x = Nitrogen Oxides

SO₂ = Sulfur Dioxide

PM₁₀ = Particles Matter (filterable only) with an aerodynamic diameter of a less than 10 micrometers

lb/hour = pounds per hour

CEMS = Continuous Emission Monitoring System

COMS = Continuous Opacity Monitoring System

Table 2A Emission Limits during Startup and Shutdown ¹ (Limited to 120 Minutes for Each Separate Event ²)				
Pollutant	Per Turbine (lb/MMBtu)		Plant Total (lb/hr)	
	While Burning Gas	While Burning Oil	While Burning Gas	While Burning Oil
NO _x	Startup – 0.676 Shutdown – 0.844	Startup – 0.700 Shutdown – 0.874	Startup – 865 Shutdown – 1080	Startup – 865 Shutdown – 1080
CO	0.183 ³	0.655 ³	132	810
VOC	0.0153	0.030	11	75

Table 2A Notes:

1. Startup: Unit startup commences when fuel is first ignited and shall not exceed 120 minutes for either turbine. Shutdown: Unit shutdown is the time period from steady state operation to cessation of combustion turbine firing. Shutdown shall not exceed 120 minutes for either turbine.
2. Emission limits are based on a 120-minute averaging period.
3. An alternative CO limit of 1.2 lb/MMBtu applies when a turbine does not operate for at least 120 consecutive minutes.

Table 2A Key:

CO = Carbon Monoxide

VOC = Volatile Organic Compounds

lb/MMBtu = pounds per million British thermal unit

NO_x = Nitrogen Oxides

lb/hr = pounds per hour

In addition to the above fuel specific emission limits, the combined emissions from EU 1 and EU 2 through the common stack cannot exceed the following emission limits averaged over any 12 consecutive months as presented in Table 2B

Table 2B Emission Limit Combined Total		
EU	Pollutant	Tons per Consecutive 12-month Period (Note 1)
1 and 2	PM/PM ₁₀	106
	SO ₂ ²	18
	NO _x	978
	CO	822
	VOC	46

Table 2B Notes:

- 1: The 12-month rolling total emission limits include emissions under **all** operating conditions including emissions that occur during emergencies, malfunctions, startups and shutdowns.
- 2: The 18 tons limit of SO₂ per 12-month period applies regardless of the sulfur content of fuel oil burned during the 12-month period.

Table 2B Key:

CO = Carbon Monoxide

PM = Particulate Matter (filterable only).

SO₂ = Sulfur Dioxide

NO_x = Nitrogen Oxides

PM₁₀ = Particles Matter (filterable only) with an aerodynamic diameter of a less than 10 micrometers

VOC = Volatile Organic Compounds

D. Testing Requirements

1. All emission testing shall comply with the test methods in accordance with requirements contained in 40 CFR Parts 72 and 75 and as noted in Table 3.

Table 3 Test Methods	
Pollutant	40 CFR Part 60 Test Methods
NO _x	Method 20 or Method 7E
CO	Method 10 (gas filter correlation (GFC) method)
VOC	Methods 25A and 18
Opacity	Method 9
SO ₂	Method 20 (fuel test option)
PM ₁₀	Method 5

2. The Permittee conducted a stack test in December 2009, while firing fuel oil on both turbines at base load for PM₁₀ and VOC emissions using EPA's emission test methods 1-5 for PM₁₀ and either methods 18 or 25A for VOC, as contained in 40 CFR part 60, Appendix A. After the December test, the Permittee shall use the same test methods to determine the rate of PM₁₀ and VOC emissions prior to every interval of 600 operating hours in which either or both turbines combust fuel oil. The requirement to conduct testing in this context will expire after the third round of stack testing.
3. An opacity study period is in effect from May 8, 2014 until March 31, 2015. During this period, each turbine combustor shall have a maximum of ten (10) operating events, [twenty (20) total combined for the two combustors]. An operating event shall consist of a single startup, a single shutdown or a single transfer from natural gas to fuel oil firing. During each startup, shutdown and fuel transfer event the Facility shall not exceed the requirements of MassDEP Air Pollution Control regulation 310 CMR 706(1)(a) -Visible Emissions. 310 CMR 7.06(1)(a) states "No person shall cause, suffer, allow, or permit the emission of smoke which has shade, density, or appearance equal to or greater than No. 1 of the Chart for a period, or aggregate period of time in excess of six minutes during any one hour, provided that at no time during the said six minutes shall the shade, density, or appearance be equal to or greater than No. 2 of the Chart."

Within 30 days from the end of the evaluation period, the Permittee shall submit a written report to MassDEP, Central Region, Bureau of Air and Climate, Permit Section Chief. The report shall include:

- a. continuous opacity readings as made by a Continuous Opacity Instrument throughout each single event;
- b. operating parameters during the event;
- c. actions taken to minimize the opacity during the event and
- d. any proposed modifications to the standard operating procedure to minimize opacity.

The Permittee may also propose an alternative opacity limit to be incorporated in the air quality plan approvals, provide the data justifies such a request.

E. Monitoring, Record Keeping, and Reporting Requirements

1. Continuous Monitors and Recorders

- a. Continuous monitors and recorders shall be installed in the common stack, calibrated, tested and operated to measure and record emissions of Carbon Monoxide (“CO”), Nitrogen Oxides (“NO_x”), Oxygen (or Carbon Dioxide) and the Opacity of the flue gas from the units. Notwithstanding the requirements of 40 CFR 60 Subpart GG 60.334, the equipment shall conform to applicable EPA monitoring specifications in 40 CFR 60.13 and 40 CFR 60 Appendices B.
- b. The Permittee shall conduct a Relative Accuracy Test Audit (RATA) on the NO_x and CO Continuous Emission Monitoring System (“CEMS”) at a frequency determined in accordance with 40 CFR 75 Appendix B, Section 2.3.1, which shall supersede the test frequency contained in 40 CFR 60 Appendix F, Section 5.1.1.
- c. Using equation numbers one and two in Appendix A, the Permittee shall attribute emissions to each combustion turbine by prorating the common stack emissions using the electrical output from each combustion turbine. Prorating will not be done when one combustion turbine is in either startup and/or shutdown mode and the other combustion turbine is operating at steady state or when both combustion turbines are in either startup and/or shutdown mode. All stack emissions will be attributed to one combustion turbine if the other combustion turbine is completely shutdown.

In the event the procedure set forth in Appendix A indicates an exceedance of an applicable emission limit, the Permittee may rebut any calculated lb/MMBtu exceedances with credible evidence. For example, if the formula indicates that both units exceeded the applicable limit, the Permittee may provide credible evidence to show that only one unit was in exceedance. Such evidence may include the results of parametric monitoring and shall be provided to EPA and MassDEP as part of the Permittee’s quarterly CEMS reports. The burden of providing such credible evidence and of proving that a calculated exceedance is not an exceedance in fact shall be on the Permittee.

- d. The Permittee shall obtain and record emission data from each CEMS and Continuous Opacity Monitoring System (“COMS”) for at least 75% of the common stack operating hours per day, for at least 84% of the common stack operating hours per month, and for at least 95% of the common stack operating hours per quarter. Notwithstanding these requirements, a minimum of four common stack operating hours are required during a unit operating day before compliance with the Percent Monitor Availability (PMA) requirement to obtain valid emissions data for at least 75% of the common stack operating hours per day be evaluated.

2. Continuous Operating Parameter Monitors and Recorders

- a. The Permittee shall monitor the total sulfur content of the fuel being fired in the turbines in accordance with 40 CFR 60.334(h) and 40 CFR 60.334(i).
- b. The Permittee shall monitor sulfur content of each new shipment of fuel oil received. Sulfur content of the fuel can be demonstrated through fuel analysis. The analysis of sulfur content of the fuel shall be in accordance with the applicable American Society for Testing Materials (ASTM) test methods of any other method approved by MassDEP and EPA. Fuel sulfur information may be provided by the suppliers.
- c. The Permittee shall operate a continuous monitoring system consistent with the requirements of 40 CFR 75 Appendix D to monitor and record the fuel oil and gas consumed by the turbines.

3. Operating and Maintenance Logs

The Permittee shall keep accurate records (electronic and/or hardcopy) of the following information for at least 5 years:

- a. Date and hours of operation of each combustion turbine.
- b. Date and time of start-up and shutdown of each combustion turbine.
- c. Date, time and specifications of all maintenance performed on each the combustion turbine, steam injection system and continuous monitoring devices and the type or a description of the maintenance performed and the date and time the work was completed.
- d. Calibration of all CEMS and COMS monitoring devices including the date, time and the name of contractor who performed the calibrations.
- e. Record of any upsets or failures associated with the CEMS and COMS.
- f. Combustion equipment, emission control or monitoring device malfunctions, time and date of malfunction, description of event, time and date of corrective action taken and description of said action.
- g. Total fuel consumption of natural gas in cubic feet per hour and total fuel consumption of fuel oil in gallons per hour.
- h. Total pounds steam flow per hour for each operating hour of the day.
- i. Total hours of operation on natural gas per day and fuel oil per day.
- j. Gross electrical output (MWh) produced for each hour of the day for each combustion turbine.

- k. Hourly heat input (MMBtu) to each combustion turbine.
 - l. Hourly NO_x and CO, emissions on a lb/MMBtu basis for each combustion turbine and lb/hr basis at the common stack.
 - m. Sulfur content records for fuel oil and natural gas.
4. The Permittee shall maintain records of the amount of fuel oil and natural gas combusted in each month and for each twelve month period.
5. The Permittee shall use the following methodology for calculating mass emissions for each pollutant:
- a. PM₁₀: The Permittee shall multiply the results from the most recent stack test (in terms of lb/MMBtu) by the fuel consumed (in terms of MMBtu) to determine the PM₁₀ mass emissions from natural gas and fuel oil. The amount of fuel consumed (in terms of MMBtu) shall be determined in accordance with 40 CFR 75 Appendix D.
 - b. Carbon Monoxide and Nitrogen Oxides: The Permittee shall use emission data from the existing continuous emission monitoring system.
 - c. Sulfur Dioxide: The Permittee shall use the sulfur content determined by 40 CFR 75 Appendix D with the exception of missing data substitution for the oil's sulfur content shall be the maximum sample value obtained in the 36 months prior to the missing data period if that value is greater than 0.0015% S, wt.
 - d. Volatile Organic Compounds: The Permittee shall multiply the results from the most recent stack test (in terms of lb/MMBtu) by the fuel consumed (in terms of MMBtu) to determine the VOC mass emissions from natural gas and fuel oil. The amount of fuel consumed (in terms of MMBtu) shall be determined in accordance with 40 CFR 75 Appendix D.
6. The Permittee shall calculate mass emissions for each twelve month rolling period by adding the emissions in the current month to the emissions in the preceding eleven months for each pollutant in condition E.5.
7. The Permittee shall maintain records required by the Federal New Source Performance Standards 40 CFR 60, Subparts A (General Provisions) and GG (Stationary Turbines).
8. The Permittee shall submit quarterly CEMS reports in writing to the MassDEP, Central Regional Office, Bureau of Air and Waste, Permit Section, 8 New Bond Street, Worcester, Massachusetts 01606 and to EPA New England. The reports will be submitted by January 30th, April 30th, July 30th and October 30th of each year and will contain at least the following information:

- a. The reports from the facility CEMS and COMS shall identify any periods of excess emissions;
 - b. For each period of excess emissions or excursions from allowable operating conditions, the Permittee shall list the duration, cause, the response taken, and the amount of excess emissions. Periods of excess emissions shall include periods of startup, shutdowns, malfunction, emergency, equipment cleaning, and upsets or failures associated with the emission control system or CEMS;
 - c. The date and time of any NO_x, CO and opacity downtime periods, defined by 40 CFR 75.10(d)(1) for NO_x, 40 CFR 60.13(h)(2) for CO, and 40 CFR 60.13(h)(1) for opacity;
 - d. A statement of whether or not the CEMS and COMS percent data recording requirements in Section E.1.d were achieved; and
 - e. A tabulation of periods of common stack and per turbine operating hours per reporting period.
9. The Permittee shall maintain records required by this Permit for at least five years. The most recent two years of data shall be readily available at the facility for MassDEP or EPA inspection.

Appendix A

CEM readings will be attributed to each turbine by using approved methods from EPA's Acid Rain Program for combined stack emissions. Forty CFR Part 75, Appendix F, Section 5.6.1 calculates heat input for each turbine based on electric generation. The following equation shall be used to determine the heat input for each turbine when the turbines are burning the same fuel.

$$\text{Eq.1 } HU_1 = HU_{cs}(T_{cs}/T_1)(MW_{1T1}/(MW_{1T1}+MW_{2T2}))$$

Where:

HU_1 = Heat input rate for unit 1, MMBtu/hr.

HU_{cs} = Heat input rate at the common pipe, MMBtu/hr.

MW_1 = Gross electrical output for unit 1, MWe.

MW_2 = Gross electrical output for unit 2, MWe.

T_1 Unit operating time for turbine 1, in equal increments of 1/60th of an hour.

T_2 Unit operating time for turbine 2, in equal increments of 1/60th of an hour.

T_{cs} = Common stack or common pipe operating time, in equal increments of 1/60th of an hour.

The combined emissions determined in the common stack will also be allocated according to the electricity each turbine produces.

$$\text{Eq. 2 } EU_1 = EU_{cs}(T_{cs}/T_1)(MW_1*PL_1*T_1/(MW_1*PL_1*T_1+MW_2*PL_2*T_2))$$

Where:

EU_1 = Emission rate for unit 1, lbs/hr.

EU_{cs} = Emission rate at the common stack, lbs/hr.

MW_1 = Gross electrical output for unit 1, MWe.

MW_2 = Gross electrical output for unit 2, MWe.

PL_1 =Depending on firing oil or natural gas, the appropriate emission limit from Tables I or II in lbs/MMBtu for unit 1

PL_2 =Depending on firing oil or natural gas, the appropriate emission limit from Tables I or II in lbs/MMBtu for unit 2

T_1 Unit operating time for turbine 1, in equal increments of 1/60th of an hour.

T_2 Unit operating time for turbine 2, in equal increments of 1/60th of an hour.

T_{cs} = Common stack or common pipe operating time, in equal increments of 1/60th of an hour.